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The question "Can a machine counsel" asks not if a machine can imitate the behavior of counselors, but rather if an identity of goals can be achieved between machine and counselor. If the goal of counseling is the discovering and internalizing of problem-solving processes, is it possible to create ".....a machine environment such than an individual within this environment can be said to have been counseled?" The authors respond with an example of such an environment--the Information System for Vocational Decisions Project (ISVD). ISVD is a working model of a computer-based information system that could become part of the vocational and educational guidance efforts of schools, employment agencies and industry. The goal is to present career data which the individual must transform into usable information. By so doing, he develops decision making abilities important to career choice. The authors admit that although the ISVD is not an ideal response to the original question, it offers a fresh look at counseling goals and how machines, with identical goals, can enter the counseling process. (LS)

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INFORMATION SYSTEM FOR VOCATIONAL DECISIONS

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CAN A MACHINE COUNSEL?

Allan B. Ellis

and

David V. Tiedeman

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Graduate School of Education
Harvard University

December 1968

CAN A MACHINE COUNSEL?*

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The Question and the Primary of Procedure

Just about everyone who spends his time trying to figure out what counseling in education is all about agrees that only human beings can counsel. These men--school counselors, professors of guidance, counseling psychologists, and the like--disagree with each other on all the other matters in their profession and this makes the one thing they agree about that much more powerful. Indeed the power of this agreement and the common sense on which it is based make the question, 'Can a machine counsel?' a very strange thing to ask. By it we seem to be wondering whether or not something can be human and non-human at the same time, and it must be difficult to imagine how we can take our question seriously. To make matters worse, we are willing to admit, for the duration of the next few paragraphs at least, that people are correct when they say that only human beings can counsel. But we do not consider this any contradiction because we go along with the consensus only to suggest that the answer to a question can be unrelated to the posing of it. We assert--and those who recall the works of G.E. Moore, Russell, Wittgenstein, and the other philosophers of language will know this is not a new idea--that the trouble with questions is that they seem so strongly to demand answers. People tend to judge questions by whether or not they can answer them, or on their willingness

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to live with the answers. But questions are good for other things, of course besides the answers to which they lead.

Our intention with the question of this paper is to gain perspective on our feelings about the activity of counseling. One thing a question can do, of course, is lead to other questions, and we hope to get from our perspective a better sense of what those other questions are that must be considered when coming to terms with our idea of counseling. Because of what machines are, we accomplish our task best, we think, by using the word 'machine' the way we do in our question.

Machines execute procedures and each machine is the embodiment of the procedure it executes. This is an important relationship that exists for all machines; people are just not in the habit of speaking about machines in this way. It means, of course, that knowing in detail what a particular machine does--how it works--is enough to know what procedure it is executing. The thing that counts about a machine is the way it behaves and this behavior is prescribed by the procedure it executes. All automation, far from being magical as some suppose, is nothing more than the physical expression of well-formed procedures.

When we say that a machine is the embodiment of the procedure it executes, we are saying, in effect, that a statement of a procedure <u>describes</u> the machine needed to carry out that procedure. Thus mechanizing means thinking about procedure, not about hardware, and once we state a procedure explicitly we should not really be surprised that a machine can be built to execute it.

To make things simpler in this paper we will confine ourselves to computers instead of machines in general. This poses no real restriction,

however, since a computer is a device whose job it is to accept descriptions of other machines and to imitate the behavior of those machines. This description is called a computer program and is usually thought of as a set of instructions for what the machine is to do. But a computer program is more like a blueprint which the computer uses to build itself into the particular machine needed to execute the particular procedure described by the program. It is as though the computer were armed with pliers and screwdriver rebuilding itself to conform step-by-step to the elements of our procedure. Having done this, the computer becomes the machine our program described, and it will then function as that machine.

A computer without a program will do nothing, whether or not it is plugged in, because computers are not like other machines. In a sense the computer is not a machine at all in its own right, and yet it can become many machines, in fact, any one which can be fully described to it. For example, one may build an address printing machine, or he may write a program which will turn a computer into an address printing machine. In either case the results will be the same with the exception that even though both machines would be operationally equivalent, they would be different from each other in one crucial respect: the computer can do other things tomorrow. Whereas the power of most machines is in what they do, the power of the computer rests in what it can become, and the essential idea of a computer is that it is an incomplete machine ready to be completed in an infinite number of ways, each way producing a different machine. Thus, a computer program is at the same time an explicit statement of a procedure and the blueprint of a machine needed to carry it out, and whether or not a computer can execute a given procedure depends primarily

upon how well we understand the components of that procedure, and how imaginative we are in conceiving procedures in terms of the basic elements of which they are comprised. Centering our attention on a computer, therefore, has the advantage that we depict a machine in terms of such a procedural statement and thus maintain a clearer attitude about machines and their relation to procedures.

Now this attitude about machines is helpful to us because, contrary to first impressions, the form of our question does not impose any pre-conceived notions on our exploration of counseling. We hope, with this attitude, to avoid the kind of commitment that led Christopher Columbus, for example, to think that Watling Island was the East Indies or the kind of vision that led Abel Tasman to discover two islands in the Southern Hemisphere and at the same time to sail completely around the continent of Australia without ever noticing it was there.

One thing this attitude about machines--and its subsequent application to the activity of counseling--frees us from is a concern about the physical aspects of machines. If there is such a thing as a counseling machine, we need not worry about whether or not it must have arms and legs. Furthermore, we are freed from the somewhat more general worry of whether or not such a machine should be able to smile or frown or nod sympathetically. We may discover later, of course, that these or similar characteristics are necessary parts of our notion of the act of counseling, but our question does not impose this on us and therefore we do not start out needing to believe that such is the case. In this spirit our question represents a point of view about problems. As with all points of view we do not expect resolution from it, but rather some insight into the topography of the

problem under consideration. This is why the answer to the question, even if it happens to come out of our analysis, is secondary to the analysis itself.

Imitation and Meaning

We begin this analysis by considering the meaning of the question, 'Can a machine counsel?' To do this we first look at the procedure adopted by the late Alan M. Turing in his consideration of a similar question. In 1950 Turing, who was an eminent mathematician and logician in England, published an article entitled "Computing Machinery and Intelligence" in which he proposed to examine the question of whether or not a machine can think. His first step was to replace this question by another "which is closely related to it and is expressed in relatively unambiguous words." He said:

> The new form of the problem can be described in terms of a game which we call the "imitation game." It is played with three people, a man (A), a woman (B), and an interrogator (C) who may be of either sex. The interrogator stays in a room apart from the other two. The object of the game for the interrogator is to determine which of the other two is the man and which is the woman. He knows them by labels X and Y, and at the end of the game he says either "X is A and Y is B" or "X is B and Y is A." The interrogator is allowed to put questions to A and B thus:
>
> C: Will X please tell me the length of his or her hair? Now suppose X is actually A, then A must answer. It is A's object in the game to try to cause C to make the wrong identification. His answer might therefore be, "My hair is shingled, and the longest strands are about nine inches long."
>
> In order that tones of voice may not help the interrogator the answers should be written, or better still, typewritten. The ideal arrangement is to have a teleprinter communicating between the two rooms. Alternatively the question and answers can be repeated by an intermediary. The object of the game for the third player (B) is to help the interrogator. The best strategy for her is probably to give truthful answers. She can add such things as "I am the woman, don't listen to him!" to her answers, but it will avail nothing as the man can make similar remarks.

> We now ask the question, "What will happen when a machine takes the part of A in this game?" Will the interrogator decide wrongly as often when the game is played like this as he does when the game is played between a man and a woman? These questions replace our original, "Can machines think?" (Turing, 1950)

Now, our interest in Turing's approach is in determining if such a procedure for establishing the meaning of the question will work for us. Can we make use of the idea of an imitation game?

Clearly, there are two kinds of imitation possible and even though Turing was never explicit about their differences, it is possible to think about the imitation game in terms of one or the other. The first of these two kinds of imitation we will call Imitation #1 for lack of some better term, although the word 'simulation' comes very close to our intended meaning. Imitation #1 consists in the machine <u>becoming</u> the thing imitated. Our question, in these terms, becomes, "Can a machine <u>be</u> a counselor?" the implication being that the inner workings of the machine would be identical to a counselor, not a particular counselor or even counselors in general. We mean that these inner workings would be such that the resultant behavior would be counseling.

If we replace our question with some test or other, perhaps one like Turing's, that would indicate whether or not a machine is making a successful Imitation #1 of a counselor, we are quickly in trouble. Aside from the formidable difficulties of constructing the test itself, we are faced with the problems posed by all the new questions that arise out of Imitation #1. Because Imitation #1 requires that the machine <u>become</u> a counselor, we must expect it to experience all the relevant conditions in which counselors find themselves. If the counselor cares, the machine must care. If he experiences the dilemma of the counselee in order to mirror its form

and substance, then so must the machine. If it is important that the counselor empathize with the client, then too must the machine empathize, and so on through the range of human conditions essential to the counselor when he counsels.

You no doubt see what we get ourselves into by adopting Imitation #1 as our meaning to the question. We are forced to expect the machine to feel what a counselor feels, and this feeling must arise <u>in the same way</u> in the machine as in the human being. But this is a contradiction, making the question nothing more chan a word game. To expect something to undergo a human experience is to expect it to become human to that extent. On what grounds, for instance, can we say that a machine that feels and loves and cares is not by that very fact human to some degree? We confuse ourselves with this not because we are led to consider machines to be human even though they are not flesh and blood and do not live and die and breathe, but because our words deceive us into thinking we ask something meaningful, when in fact all we have done is wonder if something that can become human can do human things. In light of these difficulties we reject Imitation #1 as our approach.

The second kind of imitation, which we will call Imitation #2, is essentially the approach adopted by Turing in his imitation game. Imitation #2 consists in the machine <u>behaving like</u> the thing imitated and in our case there is some hope in this approach. Our question, in these terms becomes, 'Can a machine <u>behave</u> the way counselors do?' That is, no matter what the real state of the machine, can it give the appearance of being a counselor?

An imitation counseling game in this case would become a test to see if a machine could do as well as a human counselor in exhibiting all those

behaviors which make up the relationship between the client and the counselor. For instance, can the machine exhibit concern? Can it seem to be honest and trustworthy? Can it generate confidence? Can the machine make utterances which are relevant and of a kind that assist the individual in dealing with his problem? Compared to Imitation #1, this approach seems much more manageable although we probably do not know enough about the act of counseling to be able to catalogue all the things that must be exhibited by this brand of counseling machine.

We see on closer inspection, however, that Imitation #2 is much more troublesome than Imitation #1 precisely because it seems reasonable. It does not clearly reveal its weaknesses and faulty assumptions and thus can too easily lead us astray. One objection is that Imitation #2 is based on deceit. We believe a counselor behaves in order to reveal himself, and this revelation is the mechanism by which he helps the counselee to gain insight. To mirror the counselor's behavior without the substance behind it would be to violate one of our basic premises of what counseling is. Beyond this, Imitation #2 ignores the fact that counseling behavior has its effect only when the client's perception of that behavior is appropriate. Not only must a counselor exhibit honesty, for example; the client must perceive this honesty and believe it. But regardless of its behavior, how do we convince someone that his counselor-machine is honest or concerned or even relevant?

Now these are severe handicaps and yet they are not the worst things about Imitation #2 when applied to counseling. Foremost among the difficulties with Imitation #2 is its assumption that the things a human being does when he counsels are essential to the notion of counseling itself. This

is not necessarily the case and we miss the opportunity to consider what is essential when we accept this form of imitation as appropriate. To see what we mean here, consider a mountain climber. In preparing to climb a good-sized mountain, he will, of course, pack a lot of things in his knapsack including a supply of food. Food is a very important thing on a climb of long duration, but we must be clear about the reason for this. Food is important when you climb a mountain not because it is in any way essential to the notion of mountain climbing, but precisely because human beings climb mountains and human beings must eat at regular intervals. If we built a robot to climb a mountain, no food would be needed.

It may be the same with counseling. Perhaps things like honesty are important in counseling only when human beings counsel. It may be that such things are irrelevant to counseling by machine. Imitation #2 does not allow for this possibility and thus gives up the chance we get by the use of the word 'machine' to consider what behavior is or is not essential to our view of counseling. The perspective we gain by our question we would therefore have to give up with Imitation #2. On this ground, as well as on the basis of its other weaknesses, we discard Imitation #2.

Neither kind of imitation will do, it seems, and the expectation that our question can be answered through an imitation game like Turing's must be abandoned. In saying this, we seem to do nothing more than confirm the suspicions you must have had at the onset, that the question, 'Can a machine counsel?' is a strange and fruitless one to pose. But we do not give up the enterprise because we discard Turing's approach. Indeed, we learn a very important thing from our consideration of the imitation

game--a fact which helps us construe our question properly. This is that all our difficulties with both kinds of imitation stem from the assumption that a machine can counsel only if it can mimic a human counselor. If we think of our question in a different way--one in which, although we maintain the notion of imitation, we need not expect a machine to ape a counselor--then we can proceed without running such a risk of heresy.

The idea that 'imitation' need not mean 'copying' is not new. Aristotle, for instance, begins his Poetics with a consideration of imitation and Oates and O'Neill tell us, he "is seeking to give a secondary meaning to the term." They say that Aristotle uses the word to mean the process which takes place when an artist creates his work of art. "It is through mimesis [imitation], that form comes to be imposed upon the artist's material broadly conceived," (1938, p. xxiii). That which art imitates is nature, or more accurately, the process of nature; and even though the objects of nature are natural and the objects of art are artificial, these objects of art "are produced as nature would have produced them" (McKeon, 1947, p. 621). Art imitates nature in the processes of production as well as in the objects produced.

The difference between art and nature to Aristotle rests in the difference between internal and external causation. He considers nature to be "a cause of motion internal to the thing moved, while art is an external cause employed by the artist to impose on matter a form first conceived in his mind" (McKeon, 1947, p. 621). This distinction is important to our purpose because it is in the play between the internal and the external imposition of form that we can begin to characterize

our beliefs about the act of counseling and thus the role, if any, a machine can have in this act.

The artist wishes his audience to undergo an experience and as a result to become more sensitive not to the objects of art themselves but to the natural phenomena which the process of their creation mirrors. The artist differs from others not so much because he can draw or sculpt or write the language well, but because he can experience in a natural phenomenon that which the rest of us can experience only through his artistic expression of that phenomenon. Thus the artistic process--the imitation--is a way of experiencing the world and the object of art is an effort to communicate this experience.

Artistry and Counseling

But this meaning of 'imitation' can be used also we feel to describe generally the act of counseling, and the mission of the counselor can be thought of as much like that of the artist. The counselor's material is his client's predicament and the manner in which he establishes and develops the relationship between the client and himself and their subsequent creation together of the basis for resolution of this predicament constitute the counselor's mode of imitation. The counselor's intent is not merely the resolution of difficulty, but rather the revelation of the process by which such resolution becomes possible. He accomplishes this through a kind of enactment where form comes to be imposed upon the client's predicament first by the counselor's external representation of the process of resolution, but eventually, through insight, by the client's internal experiencing of the process.

This internalization is the goal the counselor seeks to reach through the essentially artistic activity of revealing, by way of the counseling

relationship, the processes of resolution. Should the relationship become more important to either of them, then the counselor has failed just as the sculptor fails if his model of Man obscures the experiencing of men from which the sculpting stems.

Now, what all of this means, of course, is that counselors are themselves imitators. When we wonder if a machine can counsel, therefore, we will confuse the issue by expecting the machine to mimic the human counselor because in expecting this we forget that a human being is one kind of medium and a machine is another kind of medium. Because machines and human beings are different media, to expect one to act like the other is much like expecting a poet literally to paint a portrait with words. We must let the machine stay a machine, but recognize that the activity of counseling by human beings is a means to an end, this end being some desired condition in which the client will eventually find himself. Our interest thus centers on the possibilities of a machine achieving this same end even though it does so in a manner clearly different from human beings.

In this way we come to the heart of our question, 'Can a machine counsel?' By it we mean to ask: is it possible to create a machine environment such that an individual who functions in certain specifiable ways within this environment can be said to have been counseled? We do not ask if a machine can copy what human beings do when they counsel, but rather if we can achieve an identity of goals between a counselor and a machine.

The Goals of Counseling

Having settled on this meaning of the question--and thus gained the perspective we need--we are faced with the problem of answering it. To deal with this problem we will first consider what it is a machine must accomplish (notice we do not say "what it must <u>do</u>") for the answer to our

question to be 'yes.' That is, the primary concern here must be with the basis on which the question is to be answered. Following this we can assess the possibilities that such a machine can exist.

Since we pose the question in order to gain perspective on our beliefs about what counseling is, we will at this point present these beliefs although we will be general about it and hardly as explicit as might be desirable. Notice, however, that even though we speak about a particular idea of counseling, the approach to the question is not bound to any specific technique or form of counseling. As a way of viewing the problem, it is general. Thus we recognize the diversity of opinion that can be tolerated within this approach and we offer one notion of counseling not to argue its merits here but to provide a case in point from which to evolve a basis for an answer to our question.

Counselors, we assert, deal with problems of a particular kind in the manner generally proposed earlier. That is, they deal with these problems by concerning themselves, and hopefully the client, with the processes by which such problems in general may be resolved. In this way some specific problem and the resultant condition in which it leaves the counselee are used by the counselor as the material with which to fashion an understanding of the process of problem-solving. This, of course, is the reason why the giving of advice is not enough by itself to amount to counseling.

Now to be more specific about this, we argue that you should send a person to a counselor, instead of some other kind of psychologist, when that person has a problem* related to his career. The word 'career' and

*We use the strong word 'problem' here even though we consider that a problem is not the only thing that can be an appropriate motivation for seeking counsel. Curiosity, for example, may well be equally appropriate as may be the kind of involvement an individual experiences when in a game-playing mode.

the word 'problem' are two poor choices of words because in their meanings in ordinary language they do not say all we intend to say. Usually, 'career' is used in a far too limited way and 'problem' in a far too general way to suit our needs here; but they both, nonetheless, contain the grains of meaning we seek. A brief explanation of our intentions with these two words will clarify the situation.

By 'career' we do not mean just a person's job, or occupation, or vocation, or even his life's work. These are all parts of our meaning, of course, but we include much more. In saying that we include more, however, we do not mean to suggest that a career is something that is pieced together or that it is in fact definable by whatever may be included in it, anymore than we would say that the motion of a motion picture is definable in terms of the frames that make up the film or anymore than we would think of electrical current as the piecing together of electrons. Motion and flow are not inherent in the objects that move or the liquids that flow, but rather they are the impressions that moving and flowing things leave behind. Thus while motion, for instance, may be implied by objects that move, it is not in the strictest sense made up of those objects.

In this sense career is like motion. We view career--and this is not a very new idea--as the time extended working out of self. This working out of self provides the context and the opportunity for the "expression of hope and desire and limitation upon life" (Tiedeman and O'Hara, 1963, p. iv). By the working out of self, the continuity we call career is created and while purposive behavior is central to the process, we do not consider career strictly as a road that <u>leads</u> somewhere.

It is, instead, a trace of much the same kind as the bread path of Hansel and Gretel. Career is the consequence of passage.

Now the mechanism for this working out of self, and thus for the inscription of career, is the activity of deciding and this leads to our meaning of the word 'problem.' By 'problem' we mean some difficulty with deciding. The reason deciding is so important to the process is that it is by the exercise of individual freedom through choice that career becomes the mapping of self instead of just a smoke trail. One difficulty with deciding a person might have is the lack of ability to decide: he may not know how to decide. A second difficulty might be that he is not aware of the nature of the decision to be made. Perhaps the most general difficulty a person can have--one for which a counselor is most needed is the inadequate sense that one <u>can</u> decide. At the base of much trouble people have with deciding is the absence of a clear sense that a person can be an agent in determining what happens in his life. Later, we will say more of this sense of agency and its relation to the development of self.

The specifics of the process of decision-making may be characterized by way of a paradigm proposed in 1963 by Tiedeman and O'Hara. In confining the paradigm to the rational form of decision-making they state: "It seems sufficient to suggest a paradigm of the process of reaching a rational decision since such is the differentiated and later integrated condition that the practices of guidance attempt to facilitate." (p. 38) It is through the notion of decision-making as depicted in this paradigm that we will view the counselor's effort to impose form on the client's predicament and thus to reveal the processes by which the imposition of such form can be generally achieved.

According to the paradigm, the process of decision-making is divided

first into two aspects called anticipation and accommodation. The anticipation aspect consists essentially of a person's preoccupation with the pieces--facts, alternatives, options, consequences--out of which a decision is to be fashioned and with the aspirations, hopes, expectations, constraints, and the like which will determine the form of the decision. The accommodation aspect--also called "the aspect of implementation or adjustment"--represents the movement from anticipation to induction; it is the point where imagination meets reality. In the case of both anticipation and accommodation it is possible to speak about "subaspects" or stages.

The first stage of anticipation, called exploration, begins with a person's awareness "that a problem does or will exist and that a decision must be reached in order to resolve it in a satisfying manner" (p. 38). In discussing exploration, Tiedeman and O'Hara state:

> In the step of exploration...a number of different alternatives or possible goals...may be considered. Relevant goals are those which can possibly be attained from the opportunities associated with the problem under consideration.... During the exploratory step fields are relatively transitory, highly imaginary (perhaps even fantastic), and not necessarily related one to the other. They may be a relatively unassociated set of possibilities and consequences.... In the step of exploration in relation to a problem of career development, a person probably reflects at least upon his aspiration, opportunity both now and in the future, interest, capability, distasteful requirements that still can be tolerated, and societal context for himself and his dependents. These are relevant aspects of the field set by each goal. In short, a person attempts to take the measure of himself in relation to each alternative as he senses it. (pp. 38 & 41)

Of crystallization, the second stage of anticipation, they assert:

> In [crystallization] the cost of the several goals can be considered in relation to the return from each. The value of alternatives can then be assessed. Relevant considerations are organized or order in this process of valuing.... The process of valuing gives rise to values which tend to fix the organization or order of all relevant considerations in relation to each of the goals as crystallization occurs.... Crystallization normally represents a stabilization of thought. A setting of

> thought is achieved which is ordinarily of some durability and hence of some reliance. This set readies the person for investment of self along a line that then becomes more noticeable. The situation becomes defined, so to speak, at least for a time (p. 41)

The third stage is that of choice and it follows readily on the heels of crystallization. Quoting again from Tiedeman and O'Hara:

> With <u>choice</u>, a particular goal, and its relevant field... orients the behavioral system of the person of relevance for his problem.... This goal may be elected with varying degrees of certainty and its motive power will vary as a result.... Furthermore, the degrees of clarity, complexity, and freedom generally available to the person in the solution of this problem and in the pursuit of the indicated decision will also affect the motivating power of the resulting resolution of alternatives. (p. 42)

The fourth and final stage of anticipation is called <u>clarification</u>. You would expect that once a choice had been made that aspects of decision-making which precedes action would have been finished. But even though the decision is made and held firmly, often doubt about the decision will arise. This is true

> ...in even a short period of waiting (a week or more, say) for the expected situation to begin to unfold...doubt experienced in the waiting period causes the individual further to clarify his anticipated position. An elaboration and perfection of the image of the future...ensues.... <u>Clarification</u> not only perfects the image of self in position, but also dissipates some of the former doubts concerning the decision. (p. 43)

The three stages of accommodation may be briefly described in the following way:

> <u>Induction</u>:...A general defense of self and a giving up of an aspect of self to group purpose;...the individual's goal and field assimilatively become a part of the region...of the social system in which the person is implementing his desired solution of his problem. He learns the premises and structures-in-interaction required for continued identification. This process leads to a further perfection of individual goal and field in the social system....
>
> <u>Reformation</u>:...The receptive orientation of induction [<u>gives</u>]... way to [<u>an</u>] assertive orientation.... The person is well immersed in a relevant group.... He has a strong sense of self and actively enjoins the group to do better.... Since

> ...the person acts both upon the in-group goal and field...in order to bring that group into greater conformance with his modified goal and field...and upon the out-group to bring their view of his identification into greater consistency with his, the effect, is any, is the modification of group goal and field...
>
> Integration: Synthesis is, of course, the essence of integration .... A differentiation in identification has been achieved. The new-found appreciation of self is integrated with its larger field. This new part of the self-system becomes a working member of the whole self-system. In integration, individual and group both strive to keep the resulting organization of collaborative activity.... The individual is satisfied, at least temporarily, when integration occurs. (p. 44)

Now there is something peculiar about this paradigm; a potential difficulty quite similar to the problems we sometimes get into when we use language. A peculiarity of language known to philosophers for some time is that among the things we use language to talk about is language itself. Bertrand Russell, for example, had shown that it is a case of bad "philosophical syntax" to assert something like, "The golden mountain does not exist," and from that suppose you are attributing some kind of existence to the very thing whose existence is denied in the sentence. As language does sometimes, the paradigm of decision-making turns back onto itself in a way we must be clear about. Not only does the paradigm depict the decision process, it also by this depiction, prescribes how one should relate to that process. That is in enunciating the aspect of accommodation, the paradigm argues that one of the things to which one must accommodate is the decision process itself. But integration is the development of meaning that is independent of language as the instrument of that meaning. Thus, the language of decision-making, even though it is the medium through which understanding of the process comes, must be thrown off before the accommodation is complete.

This throwing off--perhaps making invisible is a better thing to say--of the instrument of meaning gets us back to the play between the external and the internal imposition of form we spoke of earlier. Accommodation to

decision-making itself is the most general kind since it represents internalization of the processes of resolution. First the language must be established for the individual (induction), then it must itself become an object of analysis (reformation), and finally it must dissolve, as the individual goes past it to meaning (integration).

By way of the essentially artistic activity described earlier, the counselor must take his client through these phases, not with respect to a particular problem so much as with respect to the process itself. He must establish the client's proficiency in the language of the process, develop his awareness of this language and its effects, and, in the end, facilitate the individual's internalization of this process. In doing this, we argue that the counselor leaves the client with a sense of agency as a logical consequence. The state in which one believes himself to be a significant agent in determining what happens to him comes not from convincing him about it but from the internalization of the decision process.

Reconsideration of the Question

Having said all of this--briefly and with hardly enough explanation--about our views of counseling we can now pursue the terms under which an answer to the question we pose in this paper might reasonably be formulated. In the most general sense, before we would be willing to say that a person has been counseled by machine, this machine would have to accomplish at least three things. First it would have to reflect the elements of decision-making in such a way that the language of the process was exposed to the client. Naturally this exposure of the language must lead to the development of the individual's proficiency in its use. Second, the machine must encourage the development of awareness of the process and the relation of self to problems as viewed by that process. That is, the process must become a mechanism for the manipulation of this relationship between self

and predicament. Finally, the machine must allow and foster the individual's accommodation to the decision process both in terms of specific predicament and, more important, in terms of the process in general. Remember, because we seek identity of goals between machine and counselor we need not expect this act of counseling to be carried out the same way by each.

But this is easy enough to say and, even though the idea of identity of goals enhances our perspective and subsequent analysis, we have no reason yet to suppose that a machine can accomplish anything resembling what we need. To repeat the point we made in the first paragraph, however, we really do not have to bother with what it would take specifically for a machine to counsel. What we are hoping for with this paper is that you will be encouraged to ask our question about your view of counseling. In our case we should go back and examine the many roads we have opened for ourselves. We should wonder, for instance, what a human counselor can do to achieve the ends of counseling as they have emerged from our attempt at the question. Are certain techniques more defensible than others? Are the honesty or the concern or the objectivity of a counselor important techniques or essential conditions of counseling? Are there pedagogical issues central to the achievement of the goals of counseling?

Even though such questions must be dealt with carefully and fully before we will know enough to talk in any but a superficial way about machines and counseling we will nonetheless attempt an answer here. For two other reasons, the answer will be bad. First it will be an answer by example which is the coward's way out. Second, it is a weak example. But some of our previous argument will at least be clarified by this attempt at an answer.

There is an old oriental saying that if a man has one hundred miles to walk, he is wise to consider himself half way there only when he has walked ninety miles of the journey. By such reckoning our example is hardly more than a glance in the direction we wish to go. For our example we will describe a project on which we have worked for about two years. This project is called ISVD which stands for an Information System for Vocational Decisions.

In June 1966 the United States Office of Education granted Harvard University's request for $1.8 million to conduct a project (contract number OEG-1-6-061819-2240) called the Information System for Vocational Decisions Project (ISVD). Cooperating with Harvard in this project is the New England Education Data Systems (NEEDS), a non-profit facility which provides computer data processing and research service to sixty-two school systems in New England. The responsibility of Harvard and NEEDS is to create a working model of a computer-based information system that can become part of the vocational and educational guidance efforts of school systems, government employment agencies, trade schools, skills training centers, and even industry. In the development of the first model, the Newton, Massachusetts school system is the main focus. This working model is to be delivered on or before 1 July 1969, which is three years and one month from the day the ISVD project began.

The theory underlying the ISVD project deliberately plays upon a potentially useful distinction between <u>data</u> (facts) and <u>information</u> (facts interpreted in relation to use). The task of the information system is to enable the individual to transform data into information. This is to be done by teaching him to interpret the data in the light of his own

knowledge, experience, and intention, so that his organization and use of the data represents his own personal relationship to them in the process of decision-making. We presume that only when data are used in this way can they be described as information where the individual is concerned. The information so generated can then, in turn, serve as data in the making of future decisions. Given that the quality of decisions is directly related to the kind, quality, and comprehensiveness of the information (i.e., data in relation to personal intention) considered by the individual during the process of decision-making, then a fundamental task of guidance is to identify, evaluate, and classify needed data and to make them readily available to students in usable forms and at needed times and places.

Throughout the individual's passage from point to point in the decision-making process, he continues to engage in the act of turning data into information. This is a major concern of the project, since, in the real world, data are never complete and neither is information Often, it is precisely this incompleteness that makes decisions necessary in the first place. In any event, the quality of the choice depends upon the quality of the data. Before one attempts to make a decision, therefore, he must first understand the incompleteness of the data and information with which he is dealing.

Accepting data and information on these terms leads naturally to the condition that one is more likely to take responsibility for the choices he makes, since they are not totally determined by external factors. If they were, then choice would be either irrelevant or superfluous. Furthermore, in order to create information on which to base decision, one must actively process data rather than passively be guided by them, and therefore,

the individual must become a significant agent in the choice process. That is, the incompleteness of data implies that the individual is responsible for his decisions in both meanings of the word: he is the one who makes the decisions, not someone or something external to him; he is the one who enjoys or suffers the consequences. This is one way to define 'freedom' and it is to this notion that the project is dedicated. It will achieve this goal by developing in the student the ability to engage in this kind of decision-making relative to his career choice. That is, the project will place the student among resources, enhance his access to them, teach him the stages in decision-making, and have him engage the resources in a controlled setting so that he can develop the skills of processing data and making decisions.

An additional factor in the decision-making procedure which this project proposes is called monitoring and consists in keeping track of the student as he goes from stage to stage through the paradigm time and again. Aside from the usual reasons for monitoring a student's behavior--to analyze his performance, select from alternate courses of action, and generally maintain an account of his interaction with a system--the project expects to present to him the facts of this monitoring so that he might use them as additional data. These facts become a kind of meta-data which the student processes. The idea of data and meta-data is analogous to the philosophical notion of being and becoming. Not only does the individual act but he becomes aware of his pattern of action. The desired result is a higher order of understanding of both the decision-making act and the panorama of career choice in which decision points are linked. Career becomes a time-extended set of choices, and decision at any given point is enhanced by an overall awareness of the road being travelled.

What the project proposes, then, is a model of decision-making behavior which requires a setting capable of providing feedback and of generating feedforward, the individual's feedforward, that is. It is an interactive setting in which an individual engages one or more data files in certain specifiable ways as a means of determining alternatives and of selecting from among them on bases understood to himself.

The setting we seek is one which will develop in the student the ability to engage in the decision process as depicted by the paradigm described earlier. Some of us call this setting a reckoning environment because we want students to do more than just make up their minds. We want them to figure up, measure, estimate, compare, judge, make calculated guesses, and in the end decide <u>and</u> take responsibility for their decisions. This, of course, is what 'deciding' means, but often people equate decision-making with choice-making and thereby miss the inherent notion of the process and its extension over time. What is left, usually, is the mistaken idea that a person decides by making up his mind, and thus we hear about the <u>moment</u> of decision as though it all happens at a point in time which is discrete and unbounded by thought and reflection. To make it clear that it is precisely this misconception and the resulting inflexibility we wish to challenge in ISVD, we have come to refer to the setting for vocational decision-making which we are creating as a vocational reckoning environment.

Once we recognize the obvious fact that data and information are never complete it becomes wise--often vital--to place the condition on choice that it be made with the best possible data available. We must ask of the data: Are they <u>accurate</u>? How <u>complete</u> are they? Do they

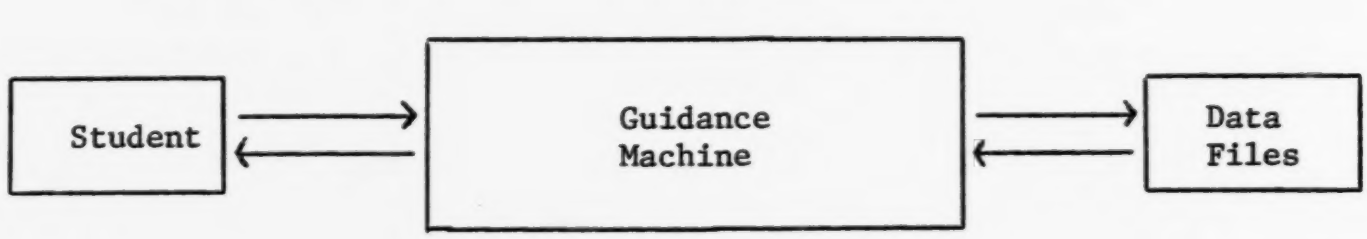
reflect the full complexity with which we must deal? Can we get them in time to explore alternatives adequately? A library is unsatisfactory in this area, because the time involved in searching is often more than the individual can afford. Certainly large amounts of data--occupational descriptions, for example--can be stored, indexed, cross-referenced, and made generally available in a library, but that is only part of what is needed. The computer, on the other hand, is capable of all this and of providing fast access so that search time need not hamper decision-making. Furthermore, the computer can interact with the student and thereby help him to ask relevant questions about the world of work. The project looks to the computer, therefore, as a device to store large amounts of occupational data and to make them immediately and selectively available to the individual as he proceeds through the decision-making process. With this kind of accessibility, the individual can feel he is among resources and as he becomes more integrated into the reckoning environment, the data become more like extensions of him and less like external qualities, that is, they move toward becoming information.

Along with the student himself there are two additional components within the ISVD reckoning environment. The first of these is an extensive collection of data about the world of work, military service, and education. Facts about jobs, colleges, trade schools, military specialties, and about the student himself are just a few of the types of data to be stored and made available to him. These data are organized into five major data files: occupational, military, educational, personal and family living, and student characteristics. Naturally while each of these files is separate from the

other, they all reference each other so that a student may follow a question through all its aspects.

Between the student and the data we intend to place a guidance machine. The function of this third and final element of the ISVD reckoning environment is to facilitate student's access to data and vice versa. That is, not only do we wish to provide a means for the student to gain convenient access to data, but we wish to keep track of such access as well. In this way, not only can an individual get facts with which to make decisions, but he can also gain a sense of the way he goes about making decisions.

One way to describe the ISVD reckoning environment is shown in this diagram.



We in ISVD call our machine a guidance machine and we will use this term for the rest of this paper even though our intention here is to suggest that its behavior approaches counseling.

Now, it is the purpose of ISVD to create a sufficiently explicit description of the behavior of a guidance machine so that a computer can behave as though it were that machine. Our efforts to create a description of a guidance machine fall into two categories. The first is the development of "Necessary Software." This consists of a fairly elaborate set of computer programs which permits certain basic and generally required functions

to be performed. We need, for example, to operate in a time-shared setting so that more than one student can use the system at any one time. Furthermore, we must provide the ability to create, maintain, edit, and retrieve data files. A programming language to allow both string manipulation and list processing, programs for statistical analyses, routines to permit content analysis, and the general facility of keeping track of who is on the system and what needs to be done next are some other examples of the kind of Necessary Computer Software with which we must be concerned.

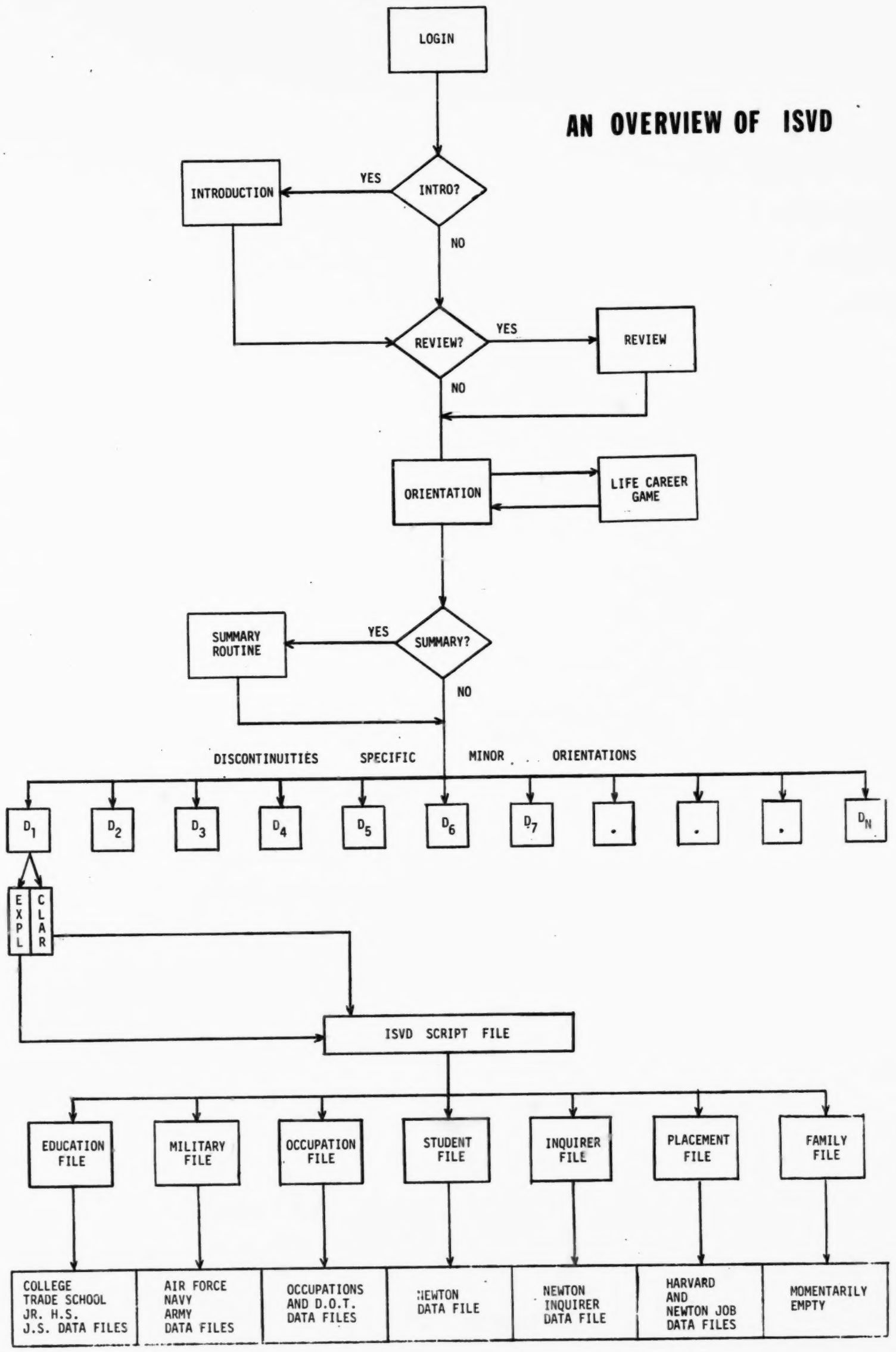
The second category, and perhaps the more interesting one, is the development of ISVD software. These are the programs that enable our time-shared computer to behave like a guidance machine, and it is here that any substantive contributions of ISVD rest.

The chart on the following page depicts in a general and incomplete way the overall organization of the ISVD software. This software may be divided into four parts each of which plays a role in the student's development of a sense for the decision process.

The first of these parts consists of the ISVD data files. In the chart these data are represented in the last two lines. Thirteen such data files are included thus far, and our plan is to increase this number as time goes on.

Even though the thirteen data files that are presently going into ISVD are different from each other in a number of respects, they are essentially alike in overall structure. A brief description of one of the data files, therefore, will provide an indication of what the rest are like. The one we will describe is the occupations data file.

AN OVERVIEW OF ISVD



The occupations data file contains about fifty facts on each of about eight hundred and fifty occupations. These facts relate to such things as wages, education, physical demands, worker traits, high school courses needed, and the like. The fifty or so facts about each occupation are grouped together to form a record. We call these level-zero records and, of course, there is one level-zero record for each occupation.

In addition to these records, we have made provision for including hierarchical records--level-one, level-two, and so forth--which may be thought of as summary records. The level-one records in the occupations data file, for instance, are used to represent simultaneously many different logical organizations of the data without concern for their physical organization. One set of such records might be used to characterize the records in terms of the Roe categories while another set might represent someone else's taxonomy.

Besides these two kinds of records, the occupations data file contains a fairly extensive collection of incomplete, but completable, English sentences of the form, 'The salary of X is Y.' or 'To be an X requires Y years of education.' If a student should ask something like, 'How much do doctors earn?' or 'How long do I have to go to school to become a plumber?' then the variables X and Y in these template sentences would be replaced by the appropriate facts and presented to the student. The use of these template sentences--and paragraphs--need not be as trivial as the example offered here.

The present version of ISVD--called Prototype I--contains in its thirteen data files several million data potentially relevant to career choice. This part of the ISVD software, while in no sense complete,

is nonetheless sufficiently extensive to allow non-trivial exploration.

As extensive as these data are, however, the single, most significant component of ISVD software is that network of routines we call scripts. Not unlike the manuscript of a play (from which it was given its name) a script is a set of rules describing how the guidance machine is to act. Scripts contain such things as the text to be presented to a student via either a video display device or a printer, commands to activate a tape recorder, or motion picture projector or to display a 35mm slide, instructions for how to process the student's responses, and rules for any computation or storage or retrieval of data.

Some scripts deal with the concepts underlying the decision process and are called teaching scripts. These scripts superficially resemble the usual computer-aided-instruction material. Preference scripts are a second kind. They are used to assist the student in his consideration of the factors on which choice may be based. The taking of a preference script has the effect of processing the associated data file, leaving behind only those records that conform to the stated preferences. Finally direct access scripts are used to retrieve specific bits of data from the files.

A third part of the ISVD software is called the Access Routine. EXPLORATION, CLARIFICATION, and REVIEW Access Routines serve to engage the student in behavior representative of the decision paradigm. They are used like filters between the student and his access to data and in this way are supposed to develop his proficiency and his awareness of the decision process. In Access Routines must rest the artistry which is inherently that of counseling.

To show what we mean here we will give an example of how an Access

Routine works. The example deals with the discontinuity of college choice; and even though this excerpt is an actual interchange between individual and a computer, we do not wish to give the impression that this program functions perfectly or even well enough to be impressive. To us it has been nothing more than a test case. In the example the computer's output is uppercase and the student's input is upper and lowercase.

WHAT WOULD YOU LIKE TO DO TODAY.

I want to think about colleges to apply to next year.

SINCE WE KNOW THAT YOU HAVE NOT EXPLORED YOUR COLLEGE CHOICE WITH THE SYSTEM BEFORE, THE FIRST THING WE WOULD LIKE TO FIND OUT IS IF YOU HAVE THOUGHT ABOUT THIS CHOICE ENOUGH TO HAVE SOME ALTERNATIVES IN MIND. IF YOU DO, TYPE THE NAMES OF EACH OF THE ALTERNATIVE COLLEGES. IF NOT, TYPE IN THE WORD NO.

Harvard University, Boston College, Berkeley.

GOOD. WHAT KINDS OF THINGS DID YOU DO IN EXPLORING COLLEGE CHOICE. DID YOU READ ANY COLLEGE CATALOGUES OR TALK WITH YOUR GUIDANCE COUNSELOR. MAKE AS COMPLETE A STATEMENT AS POSSIBLE.

I read the catalogue for Harvard and Boston College. I talked with my guidance counselor, and had a couple of interviews with the Dean at Harvard. My father went to Berkeley so that's why I'm interested in going there.

THESE ARE THE ACTIVITIES THE MACHINE HAS RECOGNIZED OR ANALYZED FROM YOUR STATEMENT. YOU HAVE DISCUSSED THE MATTER WITH MEMBERS OF THE FAMILY, SPOKEN WITH A GUIDANCE COUNSELOR, READ SOME COLLEGE CATALOGUES, SPOKEN WITH COLLEGE OFFICIALS.
HERE ARE SOME OTHER THINGS THAT MAY BE A GOOD IDEA TO DO IF YOU HAVEN'T ALREADY. YOU COULD HAVE DISCUSSED THE MATTER WITH A TEACHER. NOW THEN, LOOK AT THE LIST OF EXPLORATION ACTIVITIES THAT YOU PERFORMED OUTSIDE OF THE SYSTEM. HERE IS THE LIST OF YOUR PRESENT ALTERNATIVES.
HARVARD UNIVERSITY, BOSTON COLLEGE, AND BERKELEY. NOW TYPE IN THE ACTIVITIES THAT YOU FEEL HELPED YOU MOST ABOUT MAKING UP YOUR MIND OR GAVE YOU SOME ALTERNATIVE COLLEGES TO THINK ABOUT. PLEASE TYPE THEM IN IN ORDER OF IMPORTANCE.

The interviews and talking with my dad.

GOOD. BEFORE WE GO ON TO EXPLORE COLLEGE CHOICE, WHAT ARE THE FACTORS THAT YOU THINK ARE IMPORTANT IN CONSIDERING WHICH COLLEGES TO APPLY TO.

Grades, class rank.

ANYTHING ELSE.

Tuition costs, test scores.

HERE ARE SOME OF THE FACTORS THAT OTHER STUDENTS FOUND IMPORTANT
(1) CURRICULUM CHOICE (2) COURSE SELECTION (HIGH SCHOOL SUBJECTS)
(3) GRADES (4) CLASS RANK (5) TEST SCORES (PSAT, SAT, CEEB, ACT)
(6) EXTRA-CURRICULAR ACTIVITIES (7) FUTURE VOCATIONAL PLANS (8) GOAL
IN GOING TO COLLEGE (9) POST COLLEGE EDUCATION AND/OR TRAINING.
HERE IS YOUR LIST.
GRADES, CLASS RANK, TUITION COSTS, TEST SCORES. LOOK AT BOTH LISTS
AND THEN TYPE IN ALL FACTORS FROM BOTH LISTS THAT YOU CONSIDER IMPORTANT
IN THINKING ABOUT COLLEGE CHOICE.

High school courses, grades, class rank, test scores, tuition costs,
future vocational plans.

FINE. THERE ARE SEVERAL WAYS THAT YOU CAN GO ABOUT THINKING ABOUT COLLEGE
CHOICE WITHIN THE ISVD SYSTEM.
YOU CAN GO THROUGH SOME CONCEPT SCRIPTS WHICH ARE DESIGNED TO GIVE YOU
SOME FACTS ON TOPICS RELEVANT TO COLLEGE CHOICE. OR YOU CAN PLAY THE
LIFE CAREER GAME. USING THE DATA OF A MAKE BELEIVE STUDENT WHO IS LIKE
YOU IN SOME WAYS YOU GO THROUGH THE PROCESS OF SELECTING A COLLEGE FOR HIM.
IF YOU HAVE SPECIFIC COLLEGES IN MIND, YOU CAN GET DATA ON THEM BY
ACCESSING THE EDUCATION DATA FILE.
IF YOU LIKE, YOU CAN LET THE SYSTEM GUIDE YOU THROUGH A STATEMENT OF
PREFERENCES TO COME UP WITH A LIST OF COLLEGES THAT MOST NEARLY MATCHES
YOUR PREFERENCES. OR YOU CAN ELECT TO FIRST GO THROUGH A UNIT ON DECISION-
MAKING, A UNIT THAT TRIES TO HELP YOU UNDERSTAND YOURSELF AND OTHERS IN
RELATION TO MAKING DECISIONS.
WHAT WOULD YOU LIKE TO DO.

Access the education data file.

YOU HAVE ACCESSED THE EDUCATION DATA FILE. FOR DEMONSTRATION PURPOSES ONLY,
THE FOLLOWING SCHOOLS HAVE BEEN IMPLEMENTED. HARVARD COLLEGE (MEN), GOUCHER,
COLLEGE (WOMEN), BERKELEY UNIVERSITY (LARGE STATE SUPPORTED SCHOOL), BOSTON
COLLEGE (RELIGIOUSLY AFFILIATED), AND CARNEGIE INSTITUTE (TECHNICAL TRAINING
SCHOOL). THE FOLLOWING FOUR VARIABLES HAVE BEEN IMPLEMENTED . . . COSTS
(INCLUDING TUITION, ROOM AND BOARD, AND OTHER FEES), REQUIRED ENTRANCE
EXAMS, CRITERIA USED IN SELECTING STUDENTS AND REQUIRED HIGH SCHOOL COURSES.
NOW THEN YOU CAN QUERY THIS MICRO DATA BASE IN ANY WAY THAT YOU WANT.
PLEASE DO NOT USE QUESTION MARKS. IF YOU WISH TO STOP AT ANY TIME, TYPE
IN THE WORD STOP.
YOU MAY BEGIN.

How much does it cost to go to Harvard.

TUITION AT HARVARD IS 2000 PER YEAR INCLUDING LAB AND HEALTH FEES. ROOM AND

BOARD IS 1170 DOLLARS. NON-RESIDENT STUDENT FEE IS 25 DOLLARS. BOOKS AND SUPPLIES ABOUT 70 PER YEAR. PERSONAL EXPENSES ABOUT 375 DOLLARS INCLUDING ROOM SUPPLIES, CLOTHING, CLEANING AND LAUNDRY, RECREATION, AND OTHER PERSONAL EXPENSES (EXCEPT TRAVEL).

How does that compare with Boston College.

BOSTON COLLEGE'S TUITION IS 1600, ROOM AND BOARD IS 1050 DOLLARS. OTHER COSTS INCLUDE BOOKS AND SUPPLIES ABOUT 100 DOLLARS, LAB FEE 100 DOLLARS AND 30 DOLLARS FOR WOMEN BOARDING STUDENTS FOR HEALTH FEES.

What high school courses should I take for Boston College.

NO SPECIFIC NUMBER OF UNITS IS REQUIRED HOWEVER THE FOLLOWING MINIMUM IS REQUIRED. ENGLISH (4), ALGEBRA (2), PLANE GEOMETRY (1), FOREIGN LANGUAGE (2), TRIGONOMETRY (1/2) (FOR STUDENTS PLANNING TO MAJOR IN MATH, BIOLOGY, CHEMISTRY, OR PHYSICS), BIOLOGY, CHEMISTRY, OR PHYSICS (2) (FOR STUDENTS PLANNING TO MAJOR IN THE ABOVE SCIENCES AND FOR APPLICANTS TO THE SCHOOL OF NURSING), ACADEMIC ELECTIVES (5).

What specific entrance exams are required.

BOSTON COLLEGE REQUIRES THE SAT AND THREE ACHIEVEMENT TESTS. ENGLISH, LEVEL I OR II MATHEMATICS, AND ONE OF THE CANDIDATE'S CHOICE.

Does Berkeley require the SAT.

APPLICANTS WHO ARE INELIGIBLE, DUE TO GRADE AVERAGE, OR TO UNIT OR DISTRIBUTION DEFICIENCIES, OR WHO HAVE GRADUATED FROM AN UNACCREDITED SECONDARY SCHOOL, MAY QUALIFY FOR ADMISSION BY CEEB EXAMINATIONS. THE THREE ACHIEVEMENT TESTS REQUIRED FOR THOSE APPLYING FOR ADMISSION ARE. . ENGLISH, ONE TEST IN SOCIAL STUDIES OR FOREIGN LANGUAGE, ONE TEST IN MATHEMATICS OR A SCIENCE. REQUIREMENTS FOR CALIFORNIA RESIDENTS. . TOTAL SAT SCORE OF AT LEAST 1000, AND TOTAL SCORE ON THREE ACH OF AT LEAST 1650 WITH NO SINGLE ACH LESS THAN 500.0. REQUIREMENTS FOR OUT-OF-STATE RESIDENTS. . TOTAL SAT SCORE OF AT LEAST 1100 AND TOTAL SCORE ON THREE ACH OF AT LEAST 1725.0.

What are the costs there.

TUITION AT BERKELEY IS 980 DOLLARS PER YEAR OF THREE QUARTERS FOR OUT-OF-STATE STUDENTS. NO TUITION FOR CALIFORNIA RESIDENTS. ROOM AND BOARD VARIES BETWEEN 600 AND 940 DOLLARS. INCIDENTAL FEE OF 242 DOLLARS. ASSOCIATED STUDENTS MEMBERSHIP FEE 11 DOLLARS. BOOKS AND SUPPLIES ABOUT 80 TO 110 DOLLARS.

How do they choose their students.

BERKELEY SELECTS ITS CANDIDATES ON THE BASIS OF A CANDIDATE'S SECONDARY SCHOOL RECORD AND CEEB SCORES. ALUMNI RELATIONSHIP AND GEOGRAPHICAL DISTRIBUTION NOT RELEVANT.

How about Harvard.

HARVARD CHOOSES ITS CANDIDATES ON THE FOLLOWING CRITERIA. SECONDARY SCHOOL RECORD, SCHOOL'S RECOMMENDATION, AND CEEB SCORES. ALSO, CHARACTER, PERSONALITY AND EXTRA-CURRICULAR PARTICIPATION ARE STRONGLY EMPHASIZED. SPECIAL TALENTS AND INTERESTS ALSO CONSIDERED.

How much does it cost to go to Goucher.

THERE IS A COMPREHENSIVE FEE OF 2950 DOLLARS PER YEAR INCLUDING TUITION, ROOM AND BOARD, AND LAB FEES. STUDENT ACTIVITY FEE OF 13 DOLLARS, HEALTH FEE 50 DOLLARS, AND GYMNASIUM OUTFIT 27 DOLLARS. OTHER COSTS INCLUDE BOOKS AND SUPPLIES ABOUT 100 DOLLARS.

What kinds of courses should I take.

16 UNITS REQUIRED, THE FOLLOWING RECOMMENDED. . .ENGLISH (4), MATHEMATICS (3), (2 IN ALGEBRA, 1 IN GEOMETRY), ONE FOREIGN LANGUAGE (3), HISTORY (2), LABORATORY SCIENCE (1). THE COMMITTEE ON ADMISSIONS MAY ALLOW ENTRANCE CREDIT FOR WORK IN ELECTIVE SUBJECTS NOT LISTED.

How do they pick their students.

GOUCHER COLLEGE BASES IT CANDIDATE SELECTION ON THE SECONDARY SCHOOL RECORD, THE SCHOOL'S RECOMMENDATION, AND TEST SCORES. OTHER IMPORTANT FACTORS ARE PERSONAL CHARACTERISTICS, EXTRA-CURRICULAR PARTICIPATION, AND INDIVIDUAL INTERESTS. ALUMNAE RELATIONSHIPS AND GEOGRAPHICAL DISTRIBUTION CONSIDERED.

I think that I would like to stop now.

WOULD YOU LIKE A SUMMARY OF YOUR EXPLORATION OF THE EDUCATION DATA FILE.

Yes.

FINE.
YOU GOT DATA ON THE FOLLOWING VARIABLES FOR HARVARD COLLEGE. . COSTS, INCLUDING TUITION AND ROOM AND BOARD, HOW THE SCHOOL SELECTS ITS STUDENTS.
FOR BOSTON COLLEGE YOU GOT DATA ON THE FOLLOWING VARIABLES. . COSTS, INCLUDING TUITION AND ROOM AND BOARD, WHAT HIGH SCHOOL COURSE ARE RECOMMENDED OR REQUIRED FOR ENTRANCE, WHAT ADMISSIONS TESTS YOU SHOULD TAKE.
YOU HAVE FOUND OUT ABOUT
WHAT ADMISSIONS TESTS YOU SHOULD TAKE, COSTS, INCLUDING TUITION AND ROOM AND BOARD, HOW THE SCHOOL SELECTS ITS STUDENTS, FOR THE UNIVERSITY OF CALIFORNIA AT BERKELEY.
FOR GOUCHER COLLEGE YOU EXPLORED THE DATA ON THE FOLLOWING VARIABLES. . COSTS, INCLUDING TUITION AND ROOM AND BOARD, WHAT HIGH SCHOOL COURSES ARE RECOMMENDED OR REQUIRED FOR ENTRANCE, HOW THE SCHOOL SELECTS ITS STUDENTS.
YOU DIDN'T EXPLORE THE AVAILABLE DATA ON CARNEGIE INSTITUTE.
NOW THEN. WOULD YOU LIKE TO GO BACK AND FIND OUT ANYTHING MORE ABOUT THESE SCHOOLS.

No.

WOULD YOU LIKE TO GO INTO CLARIFICATION NOW.

Yes.

OF THE FOLLOWING COLLEGES THAT YOU HAVE EXPLORED, WHICH WOULD YOU CONSIDER APPLYING TO.
HARVARD UNIVERSITY, UNIVERSITY OF CALIFORNIA AT BERKELEY, BOSTON COLLEGE, GOUCHER COLLEGE.

Boston College, maybe Berkeley, and Harvard.

ARE THEY LISTED IN ORDER OF PREFERENCE THAT IS, IS YOUR FIRST CHOICE FIRST ETC.

No.

PLEASE TYPE THEM IN ORDER OF PREFERENCE.

Harvard University, Boston College, Berkeley.

YOU HAVE DECIDED TO GO INTO CLARIFICATION CONCERNING YOUR PREFERRED ALTERNATIVE HARVARD UNIVERSITY.
YOU HAVE ACCESSED THE EDUCATION DATA BASE AND GOTTEN SOME OF THE AVAILABLE DATA ON HARVARD UNIVERSITY.
IN EXPLORATION, YOU STATED THAT YOU CONSIDERED THE FOLLOWING TO BE IMPORTANT FACTORS IN CONSIDERING COLLEGE CHOICE. . GRADES, CLASS RANK, TEST SCORES, COURSES, GOAL.
NOW THEN, YOU SHOULD HAVE A FAIRLY GOOD IDEA OF WHERE YOU STAND IN RELATION TO THESE FACTORS AS WELL AS WHERE STUDENTS ADMITTED TO HARVARD UNIVERSITY STAND. RIGHT.

No.

WOULD YOU LIKE TO GO BACK TO EXPLORATION TO FIND OUT HOW YOU COMPARE WITH HARVARD STUDENTS.

No.

WOULD YOU LIKE TO CHOOSE ANOTHER ACTIVITY.

Sure.

WHAT WOULD YOU LIKE TO DO.

Find out about jobs.

HOW WOULD YOU LIKE TO DO THIS

I would like to access the occupation data base.

O.K.

The fourth part of the ISVD software consists of those routines that form the backdrop of the system. These elements perform the task of getting the student to the appropriate place in the system. When a student "logs on" the system he is given an introduction should he need one. He is then asked what he wishes to do. The backdrop routines process his answer and determine which discontinuity (in the chart, D_1, D_2, etc.) he is dealing with. Another routine then determines whether he is in exploration or clarification with respect to this discontinuity and passes him through the appropriate access routine. From there the student will be provided access to the relevant scripts for his situation and these scripts will in turn provide the needed access to the data bases.

This description is an oversimplification, obviously, but it makes the point of how we intend the guidance machine to function. That is, it indicates in a general way how we hope to develop--through scripts--the student's proficiency with the elements of decision-making and--through access routines--the student's awareness of the process underlying these elements. These are two of the three things which we earlier asserted a machine or a human being must accomplish to be said to be counseling.

The third requirement we listed was that the machine must allow and foster the individual's accommodation to the decision process. This, of course, is the heart of the matter.

In our development of the first prototype of ISVD we have dealt with this third requirement least of all. It is clearly the most difficult issue we face, and although we have certain hunches about it, we are not yet as clear as we would like to be. One hunch concerns the monitoring function, and we have already described how we wish to use the monitoring

of student interaction with the system as a means to reveal the process and his relation to it.

Another hunch concerns the Life Career Game and other games we plan for the system. The Life Career Game developed by Sarane Boocock (1967) and others allows a person to develop and go through a life plan for any number of ficticious people. By using this game we hope to have the student experience some of the more realistic concomitants of choice. We place the game where we do in the chart to indicate that it is not merely a component of the ISVD system. We think of it as a point of view about the system in general. That is, a student can use the ISVD either for real (with his own interests of someone he pretends to be). The two major gains with the game are the objectivity one has by dealing with someone else's predicaments, and the extension over as much as twenty (simulated) years that the game provides. As strong as these hunches are, however, we do not have enough experience yet to tell much about them.

One small force for accommodation to the system and thus to the decision process it reflects is the ISVD command language. With this simple language a student can take over control of the system flow moving about in the system the way he wishes. This is very much the kind of behavior characteristic of the integration stage of accommodation and in this way we see the possibility that one can indeed accommodate to a machine based system and thus to the process embodied by that system. We recognize that this is somewhat of an overstatement, and we would be more careful about it if our intention was to argue that ISVD's guidance machine can indeed counsel. We have no such intention.

We describe ISVD to provide a sense of what ISVD can become rather than of what it is today. Relating to the question of this paper, ISVD is not a case in point because it can prove or disprove anything about this question. On the contrary, in this case ISVD would be irrelevant. We describe ISVD to show a little bit of the relationship that exists between a process and its mechanization. It is here that ISVD is significant.

It is, of course, common sense to say that something must be proceduralized before it can be mechanized and the significance of ISVD is that it clarifies what this means. That is, when thinking about whether or not a machine can counsel, do not be deceived into assuming that the thing that must be proceduralized is the act of counseling. If you assume this you inherit all the difficulties of Imitation #1 and #2. But if you wonder, instead, what an environment might be like which has the effects of counseling in terms of what one who functions in this setting is thereby encouraged to become, then even if you decide no machine could ever be a part of this environment, you will have been left with a clearer notion of what your concept of counseling demands.

Now everything we have said in our attempt to answer the question, we recognize, is weak on at least two counts. First, of course, our assertions and our analysis of them need much more consideration if they are to become in any sense firm and sturdy. Second, not only is our example a long way from ideal, there may be no ideal to be reached. We have not gone far enough to know for sure if we can go further.

These are important limitations, but even though we have taken the question seriously enough to attempt an answer, our intention is to offer in the question a fresh look at some assumptions about counseling that are

rarely challenged. We expect quarrels over our answer because we know it is simple-minded and a bare first attempt. We hope, however, that these quarrels will not discourage you from seeing in our strategy an opportunity to start from scratch with the problem of what counseling is all about and of how machines may enter into the procedures of counseling when the goals of counseling and for the machine are consonant.

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*Included in the references are some works in which some of the ideas in this paper have been previously expressed.